CLASS 505, SUPERCONDUCTOR TECHNOLOGY: APPARATUS, MATERIAL, PROCESS

SECTION I - CLASS DEFINITION

STATEMENT OF CLASS SUBJECT MATTER

This is the generic class for subject matter involving (a) superconductor technology above 30 K and (b) Art collections involving superconductor technology. Apparatus, devices, materials, and processes involving such technology are included herein.

(1) Note. Precursors of high temperature (T_c greater than 30 K) superconducting material under the class definition or process of producing the same are placed in this class if proportionally constituted to provide the desired superconducting product upon decomposition, heating, deoxygenation, or oxidation.

The following class(es)/subclass(es) in References to Other Classes, below, specifically provide for subject matter including superconductors functioning at temperatures of 30 K and below.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

29, Metal Working, subclass 599 for process of mechanical manufacture of a superconductor.

174, Electricity: Conductors and Insulators, subclass 15.4 for cryogenic or superconductor apparatus with cooling or fluid feeding, subclass 15.5 for cable with cooling or fluid feeding, subclass 125.1 for superconductor conduit, cable or conductor structure.

204, Chemistry: Electrical and Wave Energy, subclass 192.24 for forming a superconductor by coating, forming, or etching using a sputtering operation.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 31 through 36 for Josephson tunneling type superconductive devices (subclass 33 for high temperature type devices) and subclasses 661 through 663 for devices with superconductive contacts or leads.

323, Electricity: Power Supply or Regulation Systems, subclass 360 for superconductive transformer or inductor.

324, Electricity: Measuring and Testing, subclass 248 for superconductive magnetic measuring device (i.e., magnetometer).

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclass 186 for a miscellaneous superconducting stable state circuit, subclasses 366+ for miscellaneous superconducting gating circuits, and subclasses 527+ for miscellaneous superconducting circuits.

331, Oscillators, subclass 107 for superconductive solid state active element oscillator.

333, Wave Transmission Lines and Networks, subclass 99 for miscellaneous superconductive wave transmission line or network.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 216 for superconductive magnet or electromagnet.

336, Inductor Devices, Dig. 1 for superconductive inductor.

338, Electrical Resistors, subclass 32 for superconductive resistance device responsive to magnetic field.

361, Electricity: Electrical Systems and Devices, subclass 19 for superconductor protective circuit and subclass 141 for control circuit for electromagnetic device(s) including superconductivity.

365, Static Information Storage and Retrieval, subclass 160 for superconductive static information storage device, subclass 161 for superconductive thin film-type static information storage device, and subclass 162 for superconductive Josephson junction type static information storage device.

374, Thermal Measuring and Testing, subclass 176 for temperature measurement by electric or magnetic heat sensor including sensor having hysteresis or cryogenic property (e.g., ferromagnetism, superconductivity, etc.).

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclass 93 for a superconductive element with subject matter of the class.

420, Alloys or Metallic Compositions, art collection 901 for superconductive alloy or metallic composition.

427, Coating Processes, subclasses 62+ for process of coating to produce an electrical superconductor.

428, Stock Material or Miscellaneous Articles, art collection 930 for superconductive stock material.

SECTION III - GLOSSARY

JOSEPHSON EFFECT

The passage of paired electrons (Cooper pairs) through a weak connection (Josephson junction) between superconductors as in the tunnel passage of paired electrons through a thin dielectric layer separating two superconductors.

JOSEPHSON JUNCTION

A weak connection between superconductors through which the Josephson effect is realized.

SQUID

Superconducting QUantum Interference Device

SUPERCONDUCTING

The state of a superconductor in which it exhibits superconductivity.

SUPERCONDUCTIVE

of or pertaining to a material or device which is capable of exhibiting superconductivity.

SUPERCONDUCTIVITY

A property of a material that is characterized by zero electrical resistivity and, ideally, zero permeability.

SUBCLASSES

100 HIGH TEMPERATURE (T_c GREATER THAN 30 K) SUPERCONDUCTOR MATERIAL (I.E., ELEMENT, COMPOUND, OR COMPOSITION), PER SE:
This subclass is indented under the class definition. An element, compound, or composition having a critical temperature T_c of greater than 30 K.

SEE OR SEARCH THIS CLASS, SUBCLASS:
300+, for processes of making high temperature superconducting materials.

SEE OR SEARCH CLASS:
252, Compositions, particularly subclasses 500+ for electrically conductive compositions.
423, Chemistry of Inorganic Compounds, for inorganic compounds and processes of producing same.
501, Compositions: Ceramic, for metal oxide containing compositions having glass or refractory properties as defined by Class 501.

110 Having T_c greater than or equal to 150 K:
This subclass is indented under subclass 100. Material having a critical temperature T_c greater than or equal to 150 K.

120 Thallium (Tl) containing:
This subclass is indented under subclass 100. Material having a thallium (Tl) constituent.

121 Bismuth (Bi) containing:
This subclass is indented under subclass 100. Material having a bismuth (Bi) constituent.

122 Organic polymer containing:
This subclass is indented under subclass 100. Material having a macromolecule composed of an indefinite number of organic monomer units.

123 Halogen [i.e., fluorine (Fl), chlorine (Cl), bromine (Br), iodine (I), or astatine (At)] containing:
This subclass is indented under subclass 100. Material having a fluorine (Fl), chlorine (Cl), bromine (Br), iodine (I), or astatine (At) constituent.

124 Free metal containing:
This subclass is indented under subclass 100. Material having a metal in the zero valent state as a constituent.

125 Copper (Cu) and oxygen (O) containing:
This subclass is indented under subclass 100. Material having copper (Cu) and oxygen (O) as constituents.

126 Containing three atoms of copper to between six and seven atoms of oxygen [e.g., $YCu_3O_{(7-d)}$, $LaCu_3O_{(6+d)}$, etc.]:
This subclass is indented under subclass 125. Material having a compound formula indicating three atoms of copper (Cu) to between six and seven atoms of oxygen (O) [i.e., $YCu_3O_{(7-d)}$, $LaCu_3O_{(6+d)}$, wherein d << 1].

150 HIGH TEMPERATURE (T_c GREATER THAN 30 K) DEVICES, SYSTEMS, APPARATUS, COMPONENTS, OR STOCK, OR PROCESSES OF USING:
This subclass is indented under the class definition. Articles having structure , such as devices, systems, apparatus, components, or stock, containing an element or means capable of operating as a superconductor at a critical temperature T_c of greater than 30 K, or processes of using the same.

(1) Note. Subclass 150 will take processes of using high temperature superconducting materials, per se, even if there is no indication as to what apparatus or device is involved with the use. For example, a process of using high temperature superconducting material to separate gaseous mixtures based upon differences in magnetic properties of the gaseous components goes in this subclass since no comparable apparatus subclass is provided hereinunder.

SEE OR SEARCH THIS CLASS, SUBCLASS:
100+, for an article having no structure and identified only by composition.

160 Measuring or testing system or device:
This subclass is indented under subclass 150. System or device that is utilized for measuring or testing of mechanical, electrical, chemical, or physical properties.

161 Bolometer:
This subclass is indented under subclass 160. System or device that detects temperature or amount of radiation by measuring changes in material (e.g., electrical properties, etc.) caused by the amount of heat.

SEE OR SEARCH CLASS:
374, Thermal Measuring and Testing.

162 Magnetic field sensing system or device (e.g., SQUID, etc.):
This subclass is indented under subclass 160. System or device that utilizes superconductor sensitivity of the quantum-mechanical phase to determine strengths of extremely small magnetic fields.

(1) Note. A Superconductor Quantum Interference Device, or SQUID, may consist of a loop of superconducting material containing two Josephson junctions in parallel. The input current I splits into the two halves of the loop. When the magnetic field-dependent and junction-dependent phase shifts along the paths of split currents I_1 and I_2 due to the presence of a magnetic field quantum mechanical interference, the rejoining output current results in a total current that is less than the algebraic sum of I_1 and I_2, enabling the measurement of the quantum flux.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), particularly subclasses 9+ for low temperature superconducting material containing active solid-state devices.
324, Electricity: Measuring and Testing, particularly subclass 248 for low temperature magnetometers.
600, Surgery, particularly subclasses 407+ for detecting nuclear or electromagnetic radiation, or subclass 410+ for magnetic resonance imaging.

163 Significant cryogenic refrigeration system having superconductor component as part of the system or having a superconductor device or material to be cooled present therewith (e.g., Peltier effect device, etc.):
This subclass is indented under subclass 150. Significant refrigeration system or device containing a superconductor element (a) that operates as part of the system, such as for supplying electrical current or that participates directly in the cooling through a thermoelectric effect; or

(b) that is present with the system as a device or material that is to be cooled; or process of using (a) or (b).

(1) Note. Merely reciting that a superconducting device or material is attached to a cryogenic refrigeration device or providing space or connection for flowing a cryogenic fluid will not be considered significant refrigeration structure unless structure is present that actually causes the refrigeration.

SEE OR SEARCH CLASS:
62, Refrigeration, particularly subclasses 3.2+ for thermoelectric refrigeration device (e.g., Peltier effect device, etc.) and subclass 51.1 for cryostatic device.
174, Electricity: Conductors and Insulators, particularly subclasses 15.4+ and 125.1 for low temperature superconductors having cooling fluid feeding, circulating, or distributing means.
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), particularly subclass 716 for active solid-state devices utilizing cryogenic coolant.

164 Projectile or launching device or system:
This subclass is indented under subclass 150. System or device utilizing force of a magnetic field to propel an object with such force that the object continues moving through inertia when removed from the influence of the magnetic field or object, per se, capable of being propelled by such a device or system.

SEE OR SEARCH CLASS:
89, Ordnance.
104, Railways, particularly subclasses 281+ for magnetically suspended car.
114, Ships, for propulsion and torpedo launching.
124, Mechanical Guns and Projectors.

165 System, device, or component utilizing suspension of superconducting particulate material in liquid (e.g., seal, pump, etc.):
This subclass is indented under subclass 150. System, device, or component thereof having means for utilizing a liquid suspension of particulate superconducting material.

SEE OR SEARCH CLASS:
277, Seal for a Joint or Juncture, for a generic sealing means or process.
417, Pumps.
516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase (dispersions, suspensions, sols), subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase (dispersions, suspensions, sols); or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

166 Dynamoelectric machine (e.g., motor, generator, etc.), rotational system or device (e.g., clutch, rotor, bearing, etc.), or components thereof:
This subclass is indented under subclass 150. Apparatus that converts mechanical energy to electrical energy or converts electrical energy to mechanical energy, system or device that rotates during load-bearing operation or mechanically communicates rotational force, or components thereof.

SEE OR SEARCH CLASS:
192, Clutches and Power-Stop Control.
310, Electrical Generator or Motor Structure.
318, Electricity: Motive Power Systems.
322, Electricity: Single Generator Systems.
323, Electricity: Power Supply or Regulation Systems, particularly subclass 360 for superconductor-type transformers or inductors.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, particularly subclass 216 for devices containing low temperature superconducting material.
388, Electricity: Motor Control Systems.

170 Information processing (e.g., logic circuits, computer, etc.), or information storage or retrieval system, device, or component (i.e., both dynamic and static):

This subclass is indented under subclass 150. System, device, or component (i.e., both dynamic and static) that is utilized in information or data processing, storage, or retrieval.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, particularly subclass 404 for logic circuits, subclass 200.1 for nonlinear solid-state device circuit or system, subclass 201 for neuron circuit, or subclasses 462 and 476 for low temperature superconductor devices.

346, Recorders.

360, Dynamic Magnetic Information Storage or Retrieval.

365, Static Information Storage and Retrieval, particularly subclasses 160+ for systems with a superconducting component.

369, Dynamic Information Storage or Retrieval.

395, Information Processing System Organization.

700, Data Processing: Generic Control Systems or Specific Applications.

701, Data Processing: Vehicles, Navigation, and Relative Location.

702, Data Processing: Measuring, Calibrating, or Testing.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/ Decompression.

705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination.

706, Data Processing: Artificial Intelligence.

707, Data Processing: Database and File Management, Data Structures, or Document Processing.

708, Electrical Computers: Arithmetic Processing and Calculating.

709, Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating.

710, Electrical Computers and Digital Processing Systems: Input/Output.

711, Electrical Computers and Digital Processing Systems: Memory.

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors).

713, Electrical Computers and Digital Processing Systems: Support.

714, Electrical Computers and Digital Processing Systems: Error Detection/ Correction and Fault Detection/ Recovery.

171 Recording by magnetism, magnetic record carriers, or recording head arrangements:

This subclass is indented under subclass 170. Device or system that records data utilizing magnetism, record carriers having thereon magnetic media utilized for storage or retrieval of information, or read or write head arrangements for magnetically recording.

SEE OR SEARCH CLASS:

346, Recorders, particularly subclass 74.5 for magnetos:graphic head arrangements for recording magnetic field pattern in pictorial or s:graphic form on a magnetic medium for visible display, as by development, toning, or other techniques.

360, Dynamic Magnetic Information Storage or Retrieval.

180 Device producing stimulated emission (e.g., laser, maser, etc.):

This subclass is indented under subclass 150. Device that utilizes a superconducting component to excite the oscillations of particles, or atoms or molecules between energy levels for generating coherent electromagnetic radiation in the ultraviolet, visible, infrared, or microwave region of the spectra.

SEE OR SEARCH THIS CLASS, SUBCLASS:

204, for device or system having circuitry for generation of oscillations.

SEE OR SEARCH CLASS:

330, Amplifiers, particularly subclass 4 for maser-type amplifying device.

331, Oscillators, particularly subclasses 94.1+ for molecular or particle-type oscillators (i.e., maser).

372, Coherent Light Generators, for devices not having high temperature superconducting material present.

181 Photoconductive, light transmissive, light emissive, or light responsive device or component:

This subclass is indented under subclass 150. Device or component (a) that is capable of being energized or modified by the application of light, (b) that permits light to pass through it, or (c) that emits light in response to passage of electrical current.

SEE OR SEARCH CLASS:

250, Radiant Energy, particularly subclasses 492.1+ for irradiation of objects or materials.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), containing low temperature superconducting material.

333, Wave Transmission Lines and Networks, particularly subclass 99 for low temperature superconducting transmission lines and networks.

182 Device or arrangement the operation of which is modified by changing optical properties (e.g., reflectivity, transmission, etc.) of superconductive material:

This subclass is indented under subclass 181. Devices or arrangements that respond to variation in the optical properties (e.g., reflectivity, transmission, etc.) of superconducting material.

SEE OR SEARCH CLASS:

332, Modulators.

340, Communications: Electrical, for selective visual display communication systems.

359, Optics: Systems (Including Communication) and Elements.

183 Having optical waveguide:

This subclass is indented under subclass 181. Device containing an element or element, per se, that conveys light from one point to another through an optically transparent elongated structure (i.e., usually referred to as an optical fiber or waveguide) by modulated transmissions, interreflectance, or reflectorization.

SEE OR SEARCH CLASS:

359, Optics: Systems (Including Communication) and Elements.

385, Optical Waveguides.

190 Josephson junction, per se (e.g., point contact, bridge, barrier junction, SIS, SNS, SSS, etc.), or Josephson junction with only terminals or connect:

This subclass is indented under subclass 150. Device, per se, (a) consisting of a pair of superconductive regions separated by a thin, less conductive portion or gap capable of exhibiting electron or Cooper paired electron tunneling current flow between superconducting regions referred to as a Josephson junction, per se, or (b) Josephson junction combined with only terminals or contacts.

(1) Note. Under certain conditions, a potential appears across the Josephson junction and high frequency radiation emanates from it. Under the influence of high frequency radiation, current flow through the Josephson junction may also be changed.

(2) Note. One should not assume that all so-called barriers are indicative of Josephson junctions, which require a barrier sufficiently thin for tunneling of electrons. Moreover, in this art, a barrier can have other functions, such as a protective barrier to prevent poisoning or inactivation of superconductive material, or as an insulative barrier, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

162, for SQUID device containing a Josephson junction.

170, for information processing or storage or retrieval system, device, or component.

191+, for semiconductor or thin film solid-state devices that may contain a Josephson junction, such as a Josephson transistor.

233+, for layered structure containing a superconductor layer.

SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), for devices containing low temperature superconducting Josephson junctions.

365, Static Information Storage and Retrieval, particularly subclasses 160+ for systems with a superconducting component.

191 Semiconductor thin film device or thin film electric solid-state device or system (i.e., active or passive):

This subclass is indented under subclass 150. Device or system comprising an active or passive semiconductor or thin film electric solid-state device, or processes of using the same.

(1) Note. An active or passive semiconductor or thin film electric solid-state device may be involved as a component in other devices or systems provided in subclasses 100 through 190 and 200+.

(2) Note. Reciting the composition of layers will not be sufficient for placement in this subclass unless a function of a layer other than merely conducting, insulating, supporting, or protecting is identified or unless other than layer structure is present. Moreover, superconducting layered or coiled wire, tape, cable, or fiber with or without connect, pad, or connect structure is not sufficient for this subclass.

(3) Note. One should not assume that all so-called barriers are indicative of Josephson junctions, which require a barrier sufficiently thin for tunneling of electrons. Moreover, in this art, a barrier can have other functions, such as a protective barrier to prevent poisoning or inactivation of superconductive material, as an insulative barrier, or barrier junction between semiconductors, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

180+, for solid-state device or component (a) that is capable of being energized or modified by the application of light, (b) that permits light to pass through it, or (c) that emits light in response to passage of electrical current.

190, for Josephson junction, per se, or Josephson junction with only terminal or connect.

204, for device or system with electronic circuitry for generation of oscillations.

220, for superconductor having metal connect, pad, connect structure, or patterned superconductor circuit.

230+, for layered stock having semiconductor layer, metal layer, second superconducting layer, insulating layer, or protective layers, and a superconducting layer.

SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), for devices containing low temperature superconducting material.

307, Electrical Transmission or Interconnection Systems, particularly subclass 462 and 476 for low temperature superconductor devices in nonlinear solid-state device, circuit, or system.

331, Oscillators, subclass 107 for superconductive element and tunneling element oscillators.

338, Electrical Resistors, subclass 32 for magnetic field responsive devices, including Hall effect types and low temperature superconductive devices.

365, Static Information and Storage and Retrieval, particularly subclasses 160+ for systems with a superconducting component.

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclass 74 for input circuits involving field-effect transistors; subclasses 79 and 117 for transfer means including a field effect transistor; and subclass 93 for low temperature superconductive elements.

192 Capacitor or including capacitor:

This subclass is indented under subclass 191. Device that contains a capacitor or that is limited to a passive solid-state thin film component used in electrical and electronic circuits to

store a charge of electricity, usually for very brief periods of time, with the ability to rapidly charge and discharge.

(1) Note. A capacitor is usually considered a passive component since it does not rectify, amplify, or switch and because charge carriers do not undergo energy level changes therein, although some active solid-state devices function as voltage variable capacitors.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), for devices that may contain a capacitor.
361, Electricity: Electrical Systems and Devices, for passive-state devices, such as capacitors.

193 Superconducting transistor (e.g., Josephson transistor, etc.):
This subclass is indented under subclass 191. Device or system that operates as a transistor having source, drain, and gate that includes a high temperature superconducting material as an integral portion of the transistor.

(1) Note. Usually the superconductor material comprises the source or drain having a tunneling barrier therebetween that is under the influence of a gate electrode that determines the operation of the device or system.

200 Electric discharge tube:
This subclass is indented under subclass 150. Device having a closed usually glass container under vacuum or containing a specific gas used for producing, influencing, or using a flow of electrons or ions to generate light or other electromagnetic radiation.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems.
328, Miscellaneous Electron Space Discharge Device Systems.
330, Amplifiers, for crossed field amplifier.
331, Oscillators, particularly subclass 107 for oscillators containing low temperature superconducting material.

201 Antenna:
This subclass is indented under subclass 150. A component that is the portion of a radio transmitter or receiver station used for radiating or receiving radio waves to or from space.

SEE OR SEARCH THIS CLASS, SUBCLASS:
183, for optical waveguide.

SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation).
343, Communications: Radio Wave Antennas.

202 Electric communication system containing transmitter or receiver of pulse, digital, or electromagnetic radio, television, or radar wave form:
This subclass is indented under subclass 150. System that communicates information by sending or receiving through a transmission line or space (a) electrical pulse or digital signal, or (b) radio, television, radar, electromagnetic wave signals, or directional wave characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:
170, for information processing or information storage or retrieval system, device, or component.
181+, for photoconductive, light transmissive, light emissive, or light responsive device or component.

SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radio, Radio Navigation).
358, Facsimile and Static Presentation Processing.
359, Optics: Systems (Including Communication) and Elements.
375, Pulse or Digital Communications, particularly subclass 99 for receivers with interference or noise reduction means containing low temperature superconducting material.

455, Telecommunications, for telecommunication systems that have a resonant cavity housing containing material.

203 Electroacoustic transducer:

This subclass is indented under subclass 150. Device or system for converting (a) sound waves in the form of traveling stresses in an elastic medium (e.g., air, etc.) into an electric signal or (b) an electric signal into sound waves in the form of traveling stresses in an elastic medium (e.g., air, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

201, for antenna.

202, for electric communication system containing transmitter or receiver of pulse, digital, or electromagnetic radio, television, or radar wave form.

SEE OR SEARCH CLASS:

181, Acoustics, particularly subclass 167 for diaphragms containing low temperature superconducting material.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 140+ for signal transducers that may be active solid-state devices, and including support structures, diaphragm, and pressure compensation means.

381, Electrical Audio Signal Processing Systems and Devices, particularly subclasses 396+ for electromagnetic electroacoustic transducers containing low temperature superconducting material.

204 Device or system with electronic circuitry for generation of oscillations:

This subclass is indented under subclass 150. Device or system that contains a circuit having inductance or capacitance and resistance arranged to produce a current that periodically reverses.

SEE OR SEARCH THIS CLASS, SUBCLASS:

180, for maser containing a molecular or resonant-type oscillator.

SEE OR SEARCH CLASS:

331, Oscillators, subclasses 94.1+ for molecular or resonant-type oscillators, or subclass 107 for oscillators containing low temperature superconducting material.

210 High frequency waveguides, resonators, electrical networks, or other devices of the waveguide type (e.g., phase shifters, cavity filters, etc.):

This subclass is indented under subclass 150. Devices, systems, or components that are limited to high frequency electrical transmission line or cable arrangements, resonators, delay lines, and including devices having distributed inductance and capacitance.

SEE OR SEARCH THIS CLASS, SUBCLASS:

220, for superconductor having metal connect, pad, connect structure, or patterned superconductor circuit.

230, for superconducting wire, tape, cable, or fiber, per se, that can produce magnetic effects as well as conduct electricity.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, particularly subclass 99 for low temperature superconducting transmission lines and networks.

211 Electrical energy storage device (e.g., accumulator, etc.), inductor, transformer, magnetic switch, magnetic ring, sphere, coil, or magnetic arrangement:

This subclass is indented under subclass 150. Device for storing electrical energy (e.g., accumulator, etc.), switching devices dependent on magnetism for operation, means for inducing current into wires or electrical storage devices, or magnetic ring or coil (i.e., which may include appended electrode, lead, or nominal refrigeration means); or organizations of magnets.

(1) Note. Merely reciting that a superconducting device or material is attached to a cryogenic refrigeration device or providing space or connection for flowing a cryogenic fluid will not be considered

significant refrigeration structure unless structure is present that actually causes the refrigeration.

SEE OR SEARCH THIS CLASS, SUBCLASS:

163, for significant refrigeration system or device under subclass 150 containing a superconductor element (a) that operates as part of the system, such as for supplying electrical current or that participates directly in the cooling through a thermoelectric effect, or (b) that is present with the system as a device or material that is to be cooled; or process of using (a) or (b).

220, for superconductor having metal connect, pad, connect structure, or patterned superconductor circuit.

230+, for superconducting wire, tape, cable, or fiber, per se, that can produce magnetic effects as well as conduct electricity.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclasses 15.4+ and 125.1 for low temperature superconductors having cooling fluid feeding, circulating, or distributing means.

310, Electrical Generator or Motor Structure, particularly subclass 90.5 for magnetic bearing structure containing low temperature superconducting material.

323, Electricity: Power Supply or Regulation Systems, particularly subclass 360 for systems including transformers or inductors containing low temperature superconducting material.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, particularly subclass 216 for devices containing low temperature superconducting material.

336, Inductor Devices.

212 Truncated hollow spherical or truncated cylindrical flux source bodies (e.g., magic hemisphere, magic half-ring, etc.):

This subclass is indented under subclass 211. Superconductor device, component, or stock in the form of an azimuthally circumscribed section of a nonoccupied or hollow partially cut-off sphere or ring (e.g., hemispherical, quarter-spherical, etc.).

213 Noncoiled hollow magnetic arrangement:

This subclass is indented under subclass 211. Magnetic arrangement that has a nonoccupied hollow center in which a magnetic flux can be generated and that is not manufactured by coiling or forming coils of superconducting wires.

220 Superconductor having metal connect, pad, connect structure, or patterned superconductor circuit, per se:

This subclass is indented under subclass 150. Device, component, or structure having an attached metal connect, pad, or connect structure intended to serve as a junction for receiving electrical current from an external source or a patterned interconnection of superconductor, per se, used for joining parts of an electrical system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

191+, for semiconductor or thin film solid-state devices that may contain a Josephson junction, such as a Josephson transistor.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclasses 15.4+ and 125.1 for low temperature superconductors having cooling fluid feeding, circulating, or distributing means.

230 Superconducting wire, tape, cable, or fiber, per se:

This subclass is indented under subclass 150. Superconducting stock in the form of a continuous rod, elongated flattened strip, multilayered elongated rod, or thread that may be used to conduct electrical current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

211, for wire in the form of a coil.

213, for hollow noncoiled tube.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly for low temperature superconducting wires with structure.

428, Stock Material or Miscellaneous Articles, for metal next to metal layers, or metal next to ceramic or oxide layers.

231 Having plural superconducting wire or superconducting fiber component (e.g., multifilament wire, etc.):
This subclass is indented under subclass 230. Superconducting stock wherein there is more than one superconducting rod, tape, cable, or filament arranged together or encompassed by a protecting shield.

232 Having nonsuperconducting core:
This subclass is indented under subclass 230. Wire, tape, cable, coil, or fiber wherein the center portion is made of nonsuperconducting material.

233 Superconducting layer and organic or free carbon layer (i.e., adjacent or nonadjacent to superconductor):
This subclass is indented under subclass 150. Stock or component having a superconducting layer and also either an organic layer or a free carbon layer present.

234 Superconductor next to superconductor:
This subclass is indented under subclass 150. Stock or component having one superconducting material immediately adjacent to a second superconducting material layer and wherein at least one of the superconducting materials is high temperature superconducting material.

235 Superconductor layer and one semiconducting or silicon (Si) layer:
This subclass is indented under subclass 150. Stock or component having one superconducting layer and also either a semiconductor layer or a silicon (Si) layer.

236 Superconductor layer next to free metal containing layer:
This subclass is indented under subclass 150. Stock or component having one superconducting layer immediately adjacent to a zero valent (i.e., free) metal containing layer.

SEE OR SEARCH CLASS:
174, Electricity: Conductors and Insulators, particularly for low temperature superconducting wires with structure.
428, Stock Material or Miscellaneous Articles, for metal next to metal layers, or metal next to ceramic or oxide layers.

237 Superconductor next to two or more nonsuperconductive layers:
This subclass is indented under subclass 150. Stock or component having one superconducting layer immediately adjacent to two or more nonsuperconducting layers.

238 Superconductor next to layer containing nonsuperconducting ceramic composition or inorganic compound (e.g., metal oxide, metal nitride, etc.):
This subclass is indented under subclass 150. Stock or component having one superconducting layer immediately adjacent to a layer of nonsuperconducting composition made by firing of earthy raw materials (e.g., as glass or clay, etc.) or any nonsuperconducting chemical compound that does not contain carbon, with the exception of carbon dioxide or carbonate ion (e.g., metal oxide, metal nitride, etc.).

SEE OR SEARCH CLASS:
174, Electricity: Conductors and Insulators, particularly for low temperature superconducting wires with structure.
428, Stock Material or Miscellaneous Articles, for metal next to metal layers, or metal next to ceramic or oxide layers.

239 Substrate for supporting superconductor:
This subclass is indented under subclass 150. Stock that consists of plural layers onto which a superconducting layer or preform is intended to be placed.

(1) Note. A mandatory cross-reference should be placed in Class 428 since the layered stock could be used for other purposes.

(2) Note. Compositions or compounds, per se, that serve as substrates onto which superconducting material is deposited to control crystal structure of the superconductor layer (e.g., MgO, $SrTiO_3$, YSZ, etc.) are classified as originals in the composition or compound classes.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, for metal next to metal layers, or metal next to ceramic or oxide layers.

300 PROCESSES OF PRODUCING OR TREATING HIGH TEMPERATURE (T_c GREATER THAN 30 K) SUPERCONDUCTOR MATERIAL OR SUPERCONDUCTOR CONTAINING PRODUCTS OR PRECURSORS THEREOF:

This subclass is indented under the class definition. Processes of producing or treating high temperature (T_c 30 K) superconductor material or superconductor containing products or processes of producing or treating precursors thereof.

(1) Note. Processes of using a device, system, or apparatus are placed under subclass 150 when the device is not specifically identified in the subclasses thereunder.

(2) Note. Processes of using provided devices, systems, or apparatus are located in this schedule with the named devices, systems, or apparatus.

310 With measuring or testing of superconducting properties:

This subclass is indented under subclass 300. Process that include among other operations a step of measuring or testing of superconducting characteristics.

320 Producing lattice imperfection flux pinning sites or increasing critical current density through particle bombardment, electromagnetic wave energy, or using fissionable material:

This subclass is indented under subclass 300. Process wherein a lattice imperfection flux pinning site of the superconductor is produced or critical current density of the superconductor is increased as the result of exposure to particle bombardment, electromagnetic wave energy, or through the use of fissionable material.

325 Utilizing particle (e.g., electron beam, ion, etc.) bombardment or electromagnetic wave energy (e.g., laser, etc.) treatment of selected regions to form conducting or insulating areas:

This subclass is indented under subclass 300. Process wherein treatment of selected regions by particle bombardment, or electromagnetic wave energy (e.g., laser, etc.) results in a patterning or differentiation of one area over another area by converting the area into superconducting material or by converting superconducting material into nonsuperconducting material.

329 Producing Josephson junction, per se (e.g., point contact, bridge, barrier junction, SIS, SNS, SSS, etc.):

This subclass is indented under subclass 300. Process that is limited to the production of a Josephson junction, per se (i.e., a connection consisting of a pair of superconductive regions separated by a thin, less conductive portion or gap capable of exhibiting electron or Cooper paired electron tunneling current flow between superconducting regions).

(1) Note. Under certain conditions, a potential appears across the Josephson junction and high frequency radiation emanates from it. Under the influence of high frequency radiation, current flow through the Josephson junction may also be changed.

(2) Note. One should not assume that all so-called barriers are indicative of Josephson junctions, which require a barrier sufficiently thin for tunneling of electrons. Moreover, in this art, a barrier can have other functions, such as a protective barrier to prevent poisoning or inactivation of superconductive material, or as an insulative barrier, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

330, for manufacture of a semiconductor device or thin film electric solid-state device containing more components than a single Josephson junction.

SEE OR SEARCH CLASS:

216, Etching a Substrate: Processes, subclass 3 for producing a high Tc (greater than 30oK) Josephson Junction and involving an etching step.

330 Semiconductor device or thin film electric solid-state device manufacture:

This subclass is indented under subclass 300. Process wherein an active or passive semiconductor device or thin film solid-state device is manufactured.

SEE OR SEARCH CLASS:

438, Semiconductor Device Manufacturing, subclass 2 for processes of manufacture wherein a semiconductor substrate is conjoined with a low-temperature superconductive component, see notes therein.

400 Using magnetic field (e.g., for aligning, texturizing, classifying, etc.):

This subclass is indented under subclass 300. Process wherein a magnetic field is utilized for any purpose (e.g., aligning, texturizing, classifying, etc.).

SEE OR SEARCH CLASS:

209, Classifying, Separating, and Assorting Solids.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 405+ for shaping or treating processes with direct application of electrical or wave energy to work, and subclass 108 for orienting or aligning solid particles in fluent matrix material.

401 Using sonic, ultrasonic, or vibrational energy (e.g., shock processing, vibration compacting, etc.):

This subclass is indented under subclass 300. Process wherein sonic, ultrasonic, or vibrational energy is used to treat the superconductor material or superconductor product for any purpose (e.g., shock processing, compacting, etc.).

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 603+ for vitrifying or sintering of shaped particulate bodies, subclasses 84+ for process of shaping or treating using explosive force, subclasses 104+ for forming electrical articles by shaping electroconductive material, and subclasses 109+ for consolidating to shape particulate material.

410 With material removal by etching, laser ablation, or mechanical abrasion:

This subclass is indented under subclass 300. Process wherein material is removed from a substrate (a) through chemical reaction, (b) by vaporization or decomposition due to the application of a laser, or (c) by mechanically wearing or grinding away a portion of preform to produce a pattern or shape.

(1) Note. Completely dissolving a metal portion of a metal-clad superconducting composite structure or completely dissolving a mask or resist is considered proper for this subclass and its indents.

(2) Note. Mechanically grinding to completely reduce a preform to particulate is excluded from this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

430, for process of making wire, tape, cable, coil, or fiber.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, subclasses 192.32+ for processes of sputter etching.

205, Electolysis: Processes, Compositions Used Therein and Methods of Preparing the Compositions, subclasses 640+ for electrolytic erosion of a workpiece for shape or surface change (e.g., etching, polishing, etc.).

216, Etching a Substrate: Processes, subclass 3 for etching of high Tc (greater than 30oK) superconductive material.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclass 400 for processes of material removal for shaping that utilize laser ablation of a substrate.

451, Abrading, subclasses 28+ for a process of mechanical abrading.

411 Utilizing plasma etching or sputter etching:

This subclass is indented under subclass 410. Process wherein material is removed (a) by chemical action of ionized gases in an equilib-

rium of positive or negative ions or chemical action of ionized gases in a vacuum (i.e., cold plasma), or (b) through momentum transfer elimination caused by the collision of ionized gases with the substrate.

412 Laser ablation:
This subclass is indented under subclass 410. Process where material is removed from a substrate by vaporization or decomposition brought about by the action of a laser.

413 Utilizing mask (e.g., photoresist, etc.):
This subclass is indented under subclass 410. Process wherein a shield is utilized during the etching process to protect at least a portion of a substrate from etchant, usually in a patterning operation.

420 With glass forming, working, or treating:
This subclass is indented under subclass 300. Process wherein there is a glass shaping, reshaping, or heat treating operation to change the properties of glass.

SEE OR SEARCH CLASS:
65, Glass Manufacturing, for process of glass forming, working, or treating when high temperature superconducting material is not involved.

425 Producing powder or short fiber (i.e., less than 15 cm) by spraying, dropping, or slinging of solution, suspension, or melt (e.g., spray-drying, atomizing, etc.):
This subclass is indented under subclass 300. Process wherein a liquid solution, suspension, or melt of superconducting material is subjected to atomizing, dropping, extruding, or disintegrating by centrifugal action to form by surface tension, or drying into (a) particulate, or (b) short (i.e., less than 15 cm) fiber form.

SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 5+ for processes of shaping solid particulate material directly from molten or liquid mass.

430 Process of making wire, tape, cable, coil, or fiber:
This subclass is indented under subclass 300. Process wherein the superconducting product produced is stock in the form of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread that may be used to conduct electrical current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
410, for removing metal-clad from superconducting wire by etching, laser ablation, or mechanical abrasion.

431 Making multifilament:
This subclass is indented under subclass 430. Process that produces more than one superconducting rod, tape, cable, or filament arranged together or encompassed by a protecting shield.

432 Isostatic pressing (e.g., HIP, hydrostatic pressing, etc.):
This subclass is indented under subclass 430. Process wherein the superconducting material, usually in particulate form, is compacted uniformly in all directions by the application of constant external fluid pressure to shape the superconducting material into a dense form.

SEE OR SEARCH CLASS:
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 603+ for vitrifying or sintering of shaped particulate bodies, subclasses 84+ for process of shaping or treating using explosive force, subclasses 104+ for forming electrical articles by shaping electroconductive material, and subclasses 109+ for consolidating to shape particulate material.

433 With metal deforming, metal wrapping, or metal coiling:
This subclass is indented under subclass 430. Process wherein there is a step of (a) reforming the shape of metal while in the solid state, (b) bending a thin solid metal foil to surround a preform, or (c) curling solid metal into a loop.

SEE OR SEARCH CLASS:

29, Metal Working, particularly subclass 599 for combined operations involving metal deforming and production of low temperature superconducting articles or devices.

434 With coating:

This subclass is indented under subclass 430. Process that includes a step of (a) applying or obtaining on a surface of a substrate a layer of differing composition, or (b) permeating a porous substrate with a material of composition differing from the original substrate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

440, for coating with a sol-gel composition.

446, for coating utilizing an organometallic.

452, for coating or impregnating with a melt.

470, for other coating processes.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, for processes of electroetching, electrophoretic coating, sputter etching, or sputter coating processes.

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, for electroforming and electroplating processes.

427, Coating Processes, for coating or impregnating operations involving vapor deposition, immersion, etc.

440 Utilizing sol or gel:

This subclass is indented under subclass 300. Process wherein (a) a liquid colloidal suspension, or (b) a colloid in which the disperse phase has combined with the continuous phase to produce a viscous, jellylike material, is utilized at any stage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

434, for coating of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread.

446, for coating utilizing an organometallic.

452, for coating or impregnating with a melt.

470, for other coating processes.

SEE OR SEARCH CLASS:

501, Compositions: Ceramic, particularly subclass 12 for metal oxide containing ceramic compositions and processes of manufacturing same by the sol-gel route.

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semisolid phase dispersed in primarily organic continuous liquid phase (dispersions, suspensions, sols), subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase (dispersions, suspensions, sols) subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

441 With precipitating from solution:

This subclass is indented under subclass 300. Process in which there is a step of settling small particles out of a liquid suspension by gravity or centrifugal force.

SEE OR SEARCH THIS CLASS, SUBCLASS:

425, for producing powder or small fiber (i.e., less than 15 cm) by spraying, dropping, or slinging of solution, suspension, or melt (e.g., spray drying, atomizing, etc.).

445 Using an organometallic intermediate (e.g., ligand, chelate, clathrate, etc.):
This subclass is indented under subclass 300. Process in which a compound of metal and an organic material is the transitional precursor to the superconductor final product.

SEE OR SEARCH THIS CLASS, SUBCLASS:
510, for precursor of high temperature superconductor material or stock, per se, or process of producing the precursor.

446 Including coating step:
This subclass is indented under subclass 445. Process that includes a step of (a) applying or obtaining on a surface of a substrate a layer of differing composition, or (b) permeating a porous substrate with a material of composition differing from the original substrate.

SEE OR SEARCH THIS CLASS, SUBCLASS:
434, for coating of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread.
440, for coating with a sol-gel composition.
452, for coating or impregnating with a melt.
470, for other coating processes.

SEE OR SEARCH CLASS:
427, Coating Processes, for coating or impregnating operations involving vapor deposition, immersion, etc.

447 Vapor deposition:
This subclass is indented under subclass 446. Process wherein the coating is applied or obtained by absorption or condensation of a gaseous material on a substrate, or by reaction of a gaseous material with a substrate.

450 With melting:
This subclass is indented under subclass 300. Process wherein there is a step of heating to cause a change from solid to liquid state.

(1) Note. Sintering or calcining in which only surface melting of particulate is involved is excluded from this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
490, for sintering operations that involve surface melting and shaping or consolidating of particulate material.
500, for sintering operations that involve surface melting.

451 With zone melting, zone solidification, or seed pulling:
This subclass is indented under subclass 450. Process wherein a small localized area is subjected to melting and solidification before an adjacent zone becomes melted or wherein a single crystal seed is utilized to pull a solidifying single crystal mass from a melt (e.g., Czochralski, etc.).

452 And coating or impregnating with melt:
This subclass is indented under subclass 450. Process wherein a melt is utilized in a step of (a) applying or obtaining on a surface of a substrate a layer of differing composition, or (b) permeating a porous substrate with a material of composition differing from the original substrate.

(1) Note. Melting for vaporization preparatory to vapor deposition coating is excluded from this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
434, for coating of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread.
440, for coating with a sol-gel composition.
446, for coating utilizing an organometallic.
470, for other coating processes.

SEE OR SEARCH CLASS:
427, Coating Processes, for coating or impregnating operations involving vapor deposition, immersion, etc.

460 Producing fullerene (i.e., C_{60}) type superconductor or analog thereof:
This subclass is indented under subclass 300. Process wherein the superconducting material is a doped or nondoped 60 carbon hollow, closed-caged molecule resembling a Buckmin-

ster Fuller geodesic dome or a homologous series of hollow, closed-caged molecules usually having 60 or more carbon atoms, referred to as fullerenes.

(1) Note. While, at this time, several fullerenes fail to meet the Class 505 requirement of T_c 30 K, Ebbsen, et al., Nature, 1991, 352 222, have disclosed fullerenes doped with cesium (Cs) or rubidium (Rb) having T_c 30 K as required by the class definition.

461 Producing halogen [i.e., fluorine (Fl), chlorine (Cl), bromine (Br), astatine (At)] containing superconductor:

This subclass is indented under subclass 300. Process wherein the superconducting material incorporates halogen [i.e., fluorine (Fl), chlorine (Cl), bromine (Br), astatine (At)].

SEE OR SEARCH THIS CLASS, SUBCLASS:

434, for coating of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread.
440, for coating with a sol-gel composition.
446, for coating utilizing an organometallic.
452, for coating or impregnating with a melt.
470+, for coating processes.

470 Coating:

This subclass is indented under subclass 300. Process that includes a step of (a) applying or obtaining on a surface of a substrate a layer of differing composition, or (b) permeating a porous substrate with a material of composition differing from the original substrate.

(1) Note. Complete oxidation of a material forming a new composition is not considered a coating process, even though it may be a coating that is completely oxidized. However, if oxidation occurs simultaneously with deposition of a material upon a substrate, this is viewed as a coating operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

434, for coating of a rod, elongated flattened strip, multilayered elongated rod, coil, or thread.
440, for coating with a sol-gel composition.
446, for coating utilizing an organometallic.
452, for coating or impregnating with a melt.
460, for doping or coating of fullerenes.
461, for doping or coating of superconducting materials with halogen.

SEE OR SEARCH CLASS:

204, Chemistry: Electrical and Wave Energy, for processes of electroetching, electrophoretic coating, sputter etching, or sputter coating processes.
205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, for electroforming and electroplating processes.
427, Coating Processes, for coating or impregnating operations such as vapor deposition, screen printing, immersion, etc.

471 Printing (e.g., screen printing, etc.) or application with solid coating means:

This subclass is indented under subclass 470. Process wherein coating material is applied to a substrate in a nonuniform desired pattern, or applied through the use of a solid coating means that carries the coating material into contact with the substrate with deposition thereon.

SEE OR SEARCH THIS CLASS, SUBCLASS:

440, for coating with a sol-gel composition.

472 Electrolytic or electrophoretic coating:

This subclass is indented under subclass 470. Process involving the use of electrolysis wherein a chemical change is brought about by chemical reaction that produces a coating on a substrate or involving the use of an electrical current to cause migration and deposition of a

charged particle upon a substrate (i.e., electrophoretic coating).

473 Vapor deposition:
This subclass is indented under subclass 470. Process wherein a material in a gaseous state (e.g., vapor, mist, smoke, etc.) is utilized to form a coating upon a substrate by absorption, condensation, or reaction.

474 Laser evaporative (i.e., ablative) coating:
This subclass is indented under subclass 473. Process wherein a laser is directed to a target to form the vapor that is utilized to coat a substrate.

475 Sputtering:
This subclass is indented under subclass 473. Process wherein a target is bombarded by ions in a vacuum to remove material from the target by momentum transfer and to deposit the material as a coating on a substrate.

476 RF sputtering (e.g., 13.56 MHz, etc.):
This subclass is indented under subclass 475. Process wherein radio frequency electromagnetic wave energy (e.g., 13.65 MHz, etc.) is utilized to energize the sputtering operation.

477 Using plasma:
This subclass is indented under subclass 473. Process wherein a gaseous vapor of ions in equilibrium or a vapor of ions in vacuum in nonequilibrium state referred to as a "cold plasma" is utilized while coating a substrate.

480 Utilizing electromagnetic wave energy, ion, or plasma:
This subclass is indented under subclass 300. Process wherein electromagnetic energy, ion, or a gaseous vapor of ions in equilibrium or a vapor of ions in vacuum in nonequilibrium state referred to as a "cold plasma" is utilized for any purpose not provided hereinabove.

(1) Note. Complete oxidation of a material forming a new composition is not considered a coating process. If oxidation occurs simultaneously with deposition of a material upon a substrate, this is viewed as a coating operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
411, for plasma or sputter etching.
470, for coating operations that may include utilization of electromagnetic wave energy, ion, or plasma simultaneously with a coating step.
475, for sputter coating.
477, for plasma coating.

481 Including exothermic reaction or ignition of binder:
This subclass is indented under subclass 300. Process wherein heat is evolved as a result of a chemical reaction or wherein an organic containing binder for superconducting precursors or superconducting material is burned (i.e., oxidized) to remove the binder.

482 Treating with high pressure oxygen:
This subclass is indented under subclass 300. Process wherein oxygen or an oxygen enriched gas is utilized under higher than atmospheric pressure, usually during conversion of superconductor precursor to the superconducting state.

(1) Note. Complete oxidation of a material forming a new composition is not considered a coating process. If oxidation occurs simultaneously with deposition of a material upon a substrate, this is viewed as a coating operation.

483 Utilizing fluid bed:
This subclass is indented under subclass 300. Process in which a bed of particulate material is kept in gaseous suspension at any stage in the process.

490 Shaping or consolidating (e.g., pelletizing, compacting, etc.):
This subclass is indented under subclass 300. Process wherein a superconducting body having a definite form or configuration is produced from plastic or solid material utilizing a molding surface.

(1) Note. Included herein is the compacting of solid particulate precursors of superconducting material or particulate superconducting material to produce shaped bodies (e.g., pellets, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

425, for producing powder or short fiber.

450, for melting and shaping operations that exclude sintering or calcining.

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 603+ for vitrifying or sintering of shaped particulate bodies, subclasses 84+ for process of shaping or treating using explosive force, subclasses 104+ for forming electrical articles by shaping electroconductive material, and subclasses 109+ for consolidating to shape particulate material.

491 Utilizing isostatic pressure (e.g., HIP, etc.) or specified pressure:

This subclass is indented under subclass 490. Process wherein a constant high pressure is applied during the shaping or consolidating of the material or wherein there is a specified pressure utilized during the shaping or consolidating of the material being shaped.

492 Bismuth (Bi) or thallium (Tl) containing:

This subclass is indented under subclass 490. Process wherein the superconducting material contains a bismuth (Bi) or thallium (Tl) constituent.

500 Heating, annealing, or sintering:

This subclass is indented under subclass 300. Process that includes a step of heating, annealing, or surface melting of particulate material by positive application of heat with uniting through contiguous surface phase and retention of some particulate identity.

SEE OR SEARCH THIS CLASS, SUBCLASS:

450, for melting operations that exclude sintering or calcining.

490, for sintering operations that involve the combination of surface melting and shaping or consolidating.

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, particularly subclasses 603+ for vitrifying or sintering of shaped particulate bodies, subclasses 84+ for process of shaping or treating using explosive force, subclasses 104+ for forming electrical articles by shaping electroconductive material, and subclasses 109+ for consolidating to shape particulate material.

501 Bismuth (Bi) or thallium (Tl) containing:

This subclass is indented under subclass 500. Process wherein the superconducting material contains a bismuth (Bi) or thallium (Tl) constituent.

510 PRECURSOR OF HIGH TEMPERATURE (T_c GREATER THAN 30 K) SUPERCONDUCTOR MATERIAL OR STOCK, PER SE, OR PROCESS OF PRODUCING THE PRECURSOR:

This subclass is indented under the class definition. Substances (i.e., if proportionally constituted to provide the desired superconducting product upon decomposition, heating, deoxygenation, or oxidation) that form high temperature (T_c 30 K) superconductor material , stock (e.g., target, etc.) containing the same, or process of producing the same.

SEE OR SEARCH CLASS:

252, Compositions, particularly subclasses 500+ for electrically conductive compositions.

423, Chemistry of Inorganic Compounds, for inorganic compounds and processes of producing same.

501, Compositions: Ceramic, for metal oxide containing compositions having glass or refractory properties as defined by Class 501, and processes of producing same.

511 Target for coating:

This subclass is indented under subclass 510. Precursor that will be eroded or vaporized to provide coating material for deposition.

512 Organometallic (e.g., ligand, clathrate, oxalate, etc.):
This subclass is indented under subclass 510. Subject matter wherein the precursor is an organometallic or contains organometallic.

CROSS-REFERENCE ART COLLECTIONS

700 HIGH T_c (ABOVE 30 K) SUPERCONDUCTING DEVICE, ARTICLE, OR STRUCTURED STOCK:
This subclass is indented under the class definition. Art collection comprising an electrical or magnetic device, article or structured stock which incorporates superconducting material having a superconducting transition temperature greater than 30 K.

701 Coated or thin film device (i.e., active or passive):
This subclass is indented under subclass 700. Subject matter which includes a coating or film of high temperature superconducting material as a layer on a substrate.

702 Josephson junction present:
This subclass is indented under subclass 701. Subject matter having a Josephson junction (i.e., connection between two superconducting materials through which electrons tunnel). Examples include microbridges (i.e., narrow region of superconducting material between two larger regions of superconducting material) or a superconducting-dielectric-superconducting sandwich.

703 Microelectronic device with superconducting conduction line:
This subclass is indented under subclass 701. Subject matter in which a superconducting layer or line is used to transmit current within a microelectronic device (e.g., interconnect in a printed circuit or semiconductor device).

704 Wire, fiber, or cable:
This subclass is indented under subclass 700. Subject matter wherein the superconducting material forms at least part of a wire, fiber, or cable.

705 Magnetic coil:
This subclass is indented under subclass 704. Subject matter wherein the wire or cable in the shape of a ring, spiral or helix acts or is capable of acting as an electromagnet.

706 Contact pads or leads bonded to superconductor:
This subclass is indented under subclass 700. Subject matter which include a pad or wire lead for coupling current to the superconducting material.

725 PROCESS OF MAKING OR TREATING HIGH T_c (ABOVE 30 K) SUPERCONDUCTING SHAPED MATERIAL, ARTICLE, OR DEVICE:
This subclass is indented under the class definition. Art collection limited to the methods of making or treating superconducting shaped material, article or device.

726 Measuring or testing of superconducting property:
This subclass is indented under subclass 725. Process wherein the superconducting properties of the superconducting material is tested or measured.

727 Using magnetic field:
This subclass is indented under subclass 725. Process in which a magnetic field is used during forming or treating of the superconducting material, article or device.

(1) Note. Such techniques include magnetic separation of superconducting material from nonsuperconducting material and magnetic alignment of superconducting material.

728 Etching:
This subclass is indented under subclass 725. Process involving the removal of superconducting material by any chemical or heating procedure that delineates a pattern or shape.

729 Growing single crystal (e.g., epitaxy, bulk):
This subclass is indented under subclass 725. Process in which a superconducting single crystal or single crystal film is formed (e.g., epitaxial growth, bulk solid-state growth, seed pulling).

730 Vacuum treating or coating:
This subclass is indented under subclass 725. Process which utilizes a vacuum to treat or coat a substrate (e.g., plasma spraying, molecular beam epitaxy, ion implantation).

731 Sputter coating:
This subclass is indented under subclass 730. Process in which ions from a plasma or ion beam erode a target material under vacuum to deposit a coating or film (e.g., Magnetron, D.C., A.C., reactive sputtering) on a substrate.

732 Evaporative coating with superconducting material:
This subclass is indented under subclass 730. Process wherein superconducting material is vaporized with heat to deposit a coating or film on a substrate.

733 Rapid solidification (e.g., quenching, gas-atomizing, melt-spinning, roller-quenching):
This subclass is indented under subclass 725. Process in which a molten or melted superconducting material or superconducting precursor material is rapidly cooled or quenched.

(1) Note. For purposes of this subclass, the use of quenching without indication of speed will be sufficient for placement. Moreover, the use of the techniques of gas atomization, melt-spinning or roller-quenching will be considered rapid solidification.

734 From organometallic precursors (e.g., acetylacetonates):
This subclass is indented under subclass 725. Process in which an organometallic material (e.g., acetate, acetylactonate, neodecanoate) is an intermediate or starting material utilized in the production of the superconducting material.

735 By sol-gel process:
This subclass is indented under subclass 734. Process in which a colloidal dispersion (i.e., sol) is produced and a subsequent operation produces a gel from which superconducting material is formed. The gellation stage usually involves a controlled hydrolysis and polycondensation of alkoxide precursors.

SEE OR SEARCH CLASS:
516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase (dispersions, suspensions, sols), subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase (dispersions, suspensions, sols) subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

736 From free metal precursors:
This subclass is indented under subclass 725. Process wherein at some stage in the recited process free metal was a precursor or starting material from which the superconducting material was produced.

737 From inorganic salt precursors (e.g., nitrates):
This subclass is indented under subclass 725. Process wherein at some stage in the process for making the superconductor material an inorganic metal salt (e.g., nitrates) served as an intermediate or starting material.

738 By precipitating:
This subclass is indented under subclass 737. Process wherein a solid metal salt precipitate is caused to be formed from a solution of inorganic reactants and the inorganic salt thus precipitated is treated in subsequent operations to produce superconducting material.

739 Molding, coating, shaping or casting of superconducting material:
This subclass is indented under subclass 725. Process wherein the superconducting material or the superconducting precursor material is

subjected to a molding, coating, shaping or casting operation.

740 To form wire or fiber:
This subclass is indented under subclass 739. Process wherein a wire or fiber is formed.

741 Coating or casting onto a substrate (e.g., screen printing, tape casting):
This subclass is indented under subclass 739. Process in which (e.g., screen printing, tape casting) a substrate is coated or a layer or film is cast onto a substrate to shape the layer or film.

742 Annealing:
This subclass is indented under subclass 725. Process in which the superconducting material or superconducting precursor material is annealed or subjected to a post-melting, post-sintering, or post-condensation heating operation, usually in air or a controlled oxygen environment, to produce or perfect the superconducting composition or compound.

775 HIGH T_c (ABOVE 30 K) SUPERCONDUCTING MATERIAL:
This subclass is indented under the class definition. Art collection containing a superconducting compound or composition having a superconducting transition temperature greater than 30 K or a precursor therefor.

(1) Note. A physical mixture of diverse material with the superconducting compound or composition is provided herein under in subclass 785. If diverse material is incorporated into the superconducting crystalline structure (i.e., doping), the inclusion thereof in the microstructure will not be considered, for the purpose of classification a physical mixture, and proper classification will go to the subclasses above 785. In essence, doped superconducting material will be considered a superconducting composition if it retains superconductivity.

776 Containing transition metal oxide with rare earth or alkaline earth:
This subclass is indented under subclass 775. Material which contains as part of the compound or composition a transition metal and either a Rare Earth (i.e., Sc, Y, La, Ce, Pr, Nd, PM, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu) or an Alkaline Earth (i.e., Ca, Sr, Ba, Ra).

777 Lanthanum (La) - (e.g., La2Cu04):
This subclass is indented under subclass 776. Material wherein the Rare Earth is Lanthanum (La) (e.g., La2Cu04).

778 Alkaline earth (i.e., Ca, Sr, Ba, Ra) - [e.g., La(2-x)Ba(x)Cu04]:
This subclass is indented under subclass 777. Material wherein the material contains, in addition to the Lanthanum (La), an Alkaline Earth (i.e., Calcium (Ca), Strontium (Sr), Barium (Ba) or Radium (Ra).

779 Other rare earth (i.e., Sc, Y, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu) and alkaline earth (i.e., Ca, Sr, Ba, Ra):
This subclass is indented under subclass 776. Material containing another Rare Earth i.e., Scandium (Sc), Yttrium (Y), Cerium (Ce), Praseodymium (Pr), Neodymium (Nd), Promethium (Pm), Samarium (Sm), Europium (Eu), Gadoinium (Gd), Terbium (Tb), Dysprosium (Dy), Holmium (Ho), Erbium (Er), Thulium (Tm), Ytterbium (Yb) and Lutetium (Lu) and Alkaline Earth i.e., Calcium (Ca), Strontium (Sr), Barium (Ba) or Radium (Ra) but not any Lanthanum (La).

780 Yttrium (Y) and barium (Ba) - (e.g., YBa2Cu307):
This subclass is indented under subclass 779. Material wherein the Rare Earth is Yttrium (Y) and the Alkaline Earth is Barium (Ba).

781 Noble metal (i.e., Ag, Au, Os, Ir, Pt, Ru, Rh, Pd) or chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co) or nickel (Ni) - [e.g., YBa2Cu(3-x)Fe(x)O(y)]:
This subclass is indented under subclass 780. Material containing a noble metal i.e., Silver (Ag), Gold (Au), Osmium (Os), Iridium (Ir), Platinum (Pt), Ruthenium (Ru), Rhodium (Rh) or Palladium (Pd) or one or more of the Iron Group metals i.e., Chromium (Cr), Manganese (Mn), Iron (Fe), Cobalt (Co) or Nickel (Ni).

SEE OR SEARCH THIS CLASS, SUBCLASS:
785, composition containing superconducting material and diverse nonsupercon-

ducting material when the noble metal is a diverse metal which is not part of the superconducting composition.

782 Bismuth (Bi) - (e.g., BiCaSrCuO):
This subclass is indented under subclass 776. Material containing Bismuth (Bi).

783 Thallium (Tl) - (Tl2CaBaCu308):
This subclass is indented under subclass 776. Material that contains Thallium (Tl) - (e.g., Tl2CaBaCu308).

784 Bismuth (Bi) - (e.g., BaKBiO):
This subclass is indented under subclass 775. Material that contains Bismuth (Bi) - (e.g., BaKBiO).

785 Composition containing superconducting material and diverse nonsuperconducting material:
This subclass is indented under subclass 775. Material containing superconducting material and diverse nonsuperconducting material.

(1) Note. Material implanted into the microstructure of the superconducting material as by "doping" will not be considered subject matter for this subclass and such "doped" superconducting material will be included in the above subclasses as long as the "doped" material does in fact remain superconducting. Lacking an indication to the contrary "doping" will not be considered as a coating which would be proper under subclass 700 as structured stock.

800 MATERIAL, PER SE, FOR LOW TEMPERATURE (TC AT OR BELOW 30K) OR PROCESS OF MAKING SAME:
This subclass is indented under the class definition. Art collection including, (a) substance(s) used to make a superconductor (Tc at or below 30k), (b) process of making the substance(s), or (c) the combination of (a) and (b).

801 Composition: (Classes 75, 252, 501):
This subclass is indented under subclass 800. Subject matter involving a mixture of plural substances.

802 Organic:
This subclass is indented under subclass 801. Subject matter consisting of a mixture of carbon compounds or natural substances.

803 Magnetic:
This subclass is indented under subclass 801. Subject matter wherein the composition exhibits magnetic properties.

804 Amorphous alloy:
This subclass is indented under subclass 801. Subject matter involving a solid noncrystalline substance without geometrical shape in the form of an alloy.

805 Alloy or metallic: (Class 420, 420/901):
This subclass is indented under subclass 801. Subject matter involving an alloy or metallic mixture.

806 Niobium base (Nb):
This subclass is indented under subclass 805. Subject matter composed at least 50 percent of Niobium (Nb).

807 Powder: (Class 75):
This subclass is indented under subclass 801. Subject matter involving an aggregation of loose small solid particles.

808 Liquid crystal: (Class 252):
This subclass is indented under subclass 801. Subject matter in the form of a liquid crystal.

809 Ceramic: (Class 501):
This subclass is indented under subclass 801. Subject matter in the form of ceramic matter.

810 Compound: (Class 423):
This subclass is indented under subclass 800. Subject matter consisting of a substance whose molecules are made up of unlike atoms and whose constituents cannot be separated by physical means.

811 Organic: (Classes 520 - 570):
This subclass is indented under subclass 810. Subject matter consisting of a substance whose base is carbon atom(s).

812 **Stock: (Class 428/930):**
This subclass is indented under subclass 800. Subject matter consisting of either a composition or a compound having recited structure sufficient to make it more than either a composition or compound, but said structure being insufficient to classify the same as either a product or apparatus under the rules of classification.

813 **Wire, tape, or film:**
This subclass is indented under subclass 812. Subject matter in the form of wire, tape, or film

814 **Treated metal: (Class 148/400+):**
This subclass is indented under subclass 812. Subject matter wherein the stock is a metal which has been treated to modify the characteristics thereof.

815 **Process of making, per se:**
This subclass is indented under subclass 800. Subject matter limited to the method of making the same, per se.

816 **Sputtering, including coating, forming, or etching: (Class 204/192.24):**
This subclass is indented under subclass 815. Subject matter consisting of the process of sputtering which may include coating, forming, or etching.

SEE OR SEARCH THIS CLASS, SUBCLASS:
818, for other coating processes.

817 **Forming Josephson element:**
This subclass is indented under subclass 816. Subject matter for making a Josephson junction element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
832, 874 and 922, for Josephson junction device or mechanical manufacture of same.

818 **Coating: (Classes 204, 427/62):**
This subclass is indented under subclass 815. Subject matter involving a coating operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
816, for coating by sputtering.

819 **Vapor deposition:**
This subclass is indented under subclass 818. Subject matter involving coating with a vapor.

820 **And etching:**
This subclass is indented under subclass 818. Subject matter involving removal of material from a substrate.

821 **Wire:**
This subclass is indented under subclass 818. Subject matter wherein a wire is coated.

822 **Shaping: (Classes 148, 264):**
This subclass is indented under subclass 815. Subject matter involving a molding (i.e., shaping operation).

823 **Powder metallurgy: (Class 419):**
This subclass is indented under subclass 815. Subject matter involving the production of metal, or metal containing product, from powder(s) by a sintering or like operation.

824 **Battery, thermo or photo-electric: (Class 136):**
This subclass is indented under subclass 815. Subject matter involving the production of thermoelectric or photoelectric batteries.

825 **LOW TEMPERATURE (TC AT OR BELOW 30K) SUPERCONDUCTIVITY RELATED APPARATUS, PER SE, DEVICE, PER SE, OR PROCESS OF MAKING OR OPERATING SAME:**
This subclass is indented under the class definition. Art collection involving, (a) apparatus, per se, or (b) low temperature (Tc at or below 30k) superconductor device, per se, or (c) a process of making or of operating either (a) or (b) or the combination thereof.

826 **Coating: (Class 118):**
This subclass is indented under subclass 825. Subject matter for performing a coating operation.

827 Code converter: (Class 340):
This subclass is indented under subclass 825. Subject matter including means for, (a) originating or emitting a coded set of discrete signals, or (b) translating one code into another code wherein the signal information content remains unchanged, though the format may differ.

828 Modulator: (Class 332), demodulator, or detector: (Class 329):
This subclass is indented under subclass 825. Subject matter including means either, (a) to effect a process of modifying some characteristic of an electrical signal so that it varies in step with an instantaneous value of another signal to convey information, or (b) to operate on a modulated signal to recover the modulating signal.

829 Electrical computer or data processing system: (Classes 700-714):
This subclass is indented under subclass 825. Subject matter including electrical apparatus and corresponding methods for performing data processing operations in which there is a significant change in the data, or for performing calculation operations.

830 Electrical pulse counter, pulse divider, or shift register: (Class 377):
This subclass is indented under subclass 825. Subject matter including a circuit or device for (a) making a count of electrical pulses, (b) producing output pulses which are a fraction of the number of input pulses (i.e., pulse divider), or (c) serially transforming information stored in and through a storage medium (i.e., shift register).

831 Static information storage system or device: (Class 365, 365/160):
This subclass is indented under subclass 825. Subject matter including apparatus or a corresponding process for storage and retrieval of information which does not require relative motion between the storage element and the information source.

832 Josephson junction type: (Class 365/162):
This subclass is indented under subclass 831. Subject matter wherein the storage system includes an electrical element, known as a Josephson junction -- a weak connection between superconductors through which the passage of paired electrons (Cooper pairs) is achieved -- which store information in the form of the presence or absence of a persistent current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
861, 864 and 865, for a Josephson junction device used in a nonlinear solid-state device system or circuit.
874, for a Josephson junction active solid-state device.

833 Thin film type: (Class 365/161):
This subclass is indented under subclass 831. Subject matter wherein the storage system includes an electrical element consisting of a thin film of conductive or insulative material deposited on a supporting material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
862, for thin film-type electrical element used for switching in a nonlinear solid state device circuit.

834 Plural (e.g., memory matrix, etc.): (Class 365/161):
This subclass is indented under subclass 833. Subject matter including two or more thin film storage elements.

835 Content addressed (i.e., associative memory type): (Class 365/49, 161):
This subclass is indented under subclass 834. Subject matter wherein storage locations within the storage system are identified by their contents rather than by addresses.

836 Location addressed (i.e., word organized memory type): (Class 365/161):
This subclass is indented under subclass 834. Subject matter wherein each storage location contains a group of characters, called a word, arranged such that each position, or group of positions, in the word contains specific information and is addressed by a character, or characters, which identifies the location of the word.

837 Random access (i.e., bit organized memory type): (Class 365/161):
This subclass is indented under subclass 834. Subject matter wherein the storage elements can be addressed in random sequence.

838 Plural: (e.g., memory matrix, etc.): (Class 365/160):
This subclass is indented under subclass 831. Subject matter including two or more static information storage systems or devices.

839 Content addressed (i.e., associative memory type): (Class 365/160):
This subclass is indented under subclass 838. Subject matter wherein storage locations within the storage system or device are identified by their contents rather than by addresses.

840 Location addressed (i.e., word organized memory type): (Class 365/160):
This subclass is indented under subclass 838. Subject matter wherein each storage location contains a group of characters, called a word, arranged such that each position, or group of positions, in the word contains specific information and is addressed by a character, or characters, which identifies the location of the word.

841 Random access (i.e., bit organized memory type: (Class 365/160):
This subclass is indented under subclass 838. Subject matter wherein the storage locations within the storage system or device can be addressed in random sequence.

842 Measuring and testing: (Classes 73, 324, 356, and 374):
This subclass is indented under subclass 825. Subject matter comprising a method or apparatus for calibrating, inspecting, measuring, sampling, or testing.

843 Electrical: (Class 324):
This subclass is indented under subclass 842. Subject matter wherein the method or apparatus for calibrating, inspecting, measuring, sampling, or testing either, (a) detects an electrical property of matter, or (b) detects a nonelectrical property by using an electrical principle of operation.

844 Nuclear magnetic resonance (NMR) system or device: (Class 324):
This subclass is indented under subclass 843. Subject matter wherein the energy interchange between precessing atomic particles and a surrounding variable magnetic field is measured at a preferred (resonant) frequency.

845 Magnetometer: (Class 324/248):
This subclass is indented under subclass 843. Subject matter wherein the electrical property of matter which is detected is the direction or intensity of a magnetic field.

846 Using superconductive quantum interference device (i.e., SQUID): (Class 324/248):
This subclass is indented under subclass 845. Subject matter wherein the direction or intensity of a magnetic field is sensed by a device, known as a SQUID, comprised of a superconducting loop containing one or two weak links, known as Josephson junctions, which permit conduction through a thin dielectric layer by quantum mechanical tunneling.

847 Thermal: (Class 374):
This subclass is indented under subclass 842. Subject matter wherein the method or apparatus for calibrating, inspecting, measuring, sampling, or testing is designed to detect the kinetic energy of atoms or molecules within a body of matter.

848 Radiant energy application: (Class 250):
This subclass is indented under subclass 825. Subject matter including means for using, generating, controlling, or detecting energy propagated in the form of electromagnetic waves or travelling subatomic, atomic, or molecular particles.

849 Infrared responsive electric signaling: (Class 250/338+):
This subclass is indented under subclass 848. Subject matter including means to generate an electrical signal in response to irradiation by electromagnetic waves in the infrared range (approximately 760 nanometers to one millimeter).

850 Protective circuit: (Class 361/19):
This subclass is indented under subclass 825. Subject matter including means for electrically providing for the safety and protection of an electrical system or device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
872, for a superconductor magnetic field shield which protects an electrical device or circuit from ambient magnetic fields.

851 Control circuit for electromagnetic device: (Class 361/141):
This subclass is indented under subclass 825. Subject matter comprising a circuit for the control of a relay or other electromagnetic device.

852 Electric motor control: (Class 318):
This subclass is indented under subclass 825. Subject matter wherein an electrical circuit or device, which controls the operation of an electric motor includes superconducting components.

853 Oscillator: (Class 331):
This subclass is indented under subclass 825. Subject matter including means for initiating and maintaining an electrical signal or an electromagnetic wave having a strictly periodic repetitious frequency.

854 With solid state active element: (Class 331/107):
This subclass is indented under subclass 853. Subject matter wherein the electrical signal is generated by a circuit composed of semiconductors such as solid state diodes or transistors.

(1) Note. Active devices include transistors and diodes but exclude impedance only devices such as resistors, capacitors, and inductors, which are considered to be passive devices.

855 Amplifier: (Class 330):
This subclass is indented under subclass 825. Subject matter wherein a variable electrical current or voltage input signal is applied to a device (i.e., amplifier) which controls a source of electrical energy applied to the same device from which is derived an enhanced output signal having substantially the same wave-form as the input signal.

856 Electrical transmission or interconnection system: (Class 307):
This subclass is indented under subclass 825. Subject matter wherein circuitry for the transmission of electricity between or among various active electrical devices is provided and a portion of the circuitry, one or more of the devices, or any combination thereof, is operated in a state of superconductivity.

857 Nonlinear solid state device system or circuit: (Class 307/200+):
This subclass is indented under subclass 856. Subject matter whose specific function is not provided for elsewhere comprising circuits or devices which include solid state devices or components through which charge carriers are conducted, the current versus voltage characteristic of such device or component being nonlinear.

(1) Note. This definition excludes linear resistors, capacitors, inductors, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
830, for solid-state pulse counters, pulse dividers, and shift registers.
854, for solid-state oscillators.
855, for solid-state amplifiers.
873+, for active solid-state devices (e.g., transistors, diodes, etc.), per se.

858 Digital logic: (Class 307/476):
This subclass is indented under subclass 857. Subject matter wherein nonarithmetical operations (e.g., selecting, sorting, matching, comparing, etc.) are performed using digital (i.e., discontinuous or discrete) electrical signal information.

859 Function of AND, OR, NAND, NOR or NOT: (Class 307/462):
This subclass is indented under subclass 858. Subject matter wherein the digital operations performed are limited to those defined by the Boolean operations of AND, OR, NAND, NOR or NOT.

860 Gating (i.e., switching) circuit: (Class 307/245):
This subclass is indented under subclass 857. Subject matter including means whereby one signal (a controlling signal) is used to control another signal (a controlled signal) by permitting, or preventing, the transmission of the controlled signal along a given path of the circuit.

861 With josephson junction: (Class 307/245):
This subclass is indented under subclass 860. Subject matter wherein the means of control is a device, known as a Josephson junction, which permits conduction through a thin dielectric layer by quantum mechanical tunneling.

SEE OR SEARCH THIS CLASS, SUBCLASS:
832, for Josephson junctions used in static information storage systems.
864, and 865, for Josephson junctions used in nonlinear solid state device circuits of other utilities.
874, for Josephson junction active solid state devices.

862 With thin film device: (Class 307/245):
This subclass is indented under subclass 860. Subject matter wherein the means of control includes an electrical element consisting of a thin film of conductive or insulative material deposited on a supporting material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
833, for thin film-type electrical elements used in static information storage circuits.

863 Stable state circuit for signal shaping, converting, or generating: (Class 307/277):
This subclass is indented under subclass 857. Subject matter including circuit means capable of at least one or more distinct current conductive stable states for, (a) producing an output signal having a particular waveform; or (b) modifying either, (1) a constant (DC) input, or (2) the waveform of a time varying (AC) input signal.

(1) Note. The modified form or shape is not merely one of magnitude such as would result from a change in amplitude or frequency, but is the result of the modification or conversion of one waveform into a waveform of significantly different form a shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
853+, for circuits capable of free-running or self-sustained oscillation, per se.

864 With Josephson junction: (Class 307/277):
This subclass is indented under subclass 863. Subject matter wherein the waveform modifying circuit or device includes a device, known as a Josephson junction, which permits conduction through a thin dielectric layer by quantum mechanical tunneling.

SEE OR SEARCH THIS CLASS, SUBCLASS:
832, for Josephson junction-type devices used in static information storage systems.
861, and 865, for Josephson junction devices used in nonlinear solid state device circuits of other utility.
874, for Josephson junction active solid state devices.

865 With Josephson junction: (Class 307/306):
This subclass is indented under subclass 857. Subject matter wherein at least one of the active circuit elements or devices includes a device, known as a Josephson junction, which permits conduction through a thin dielectric layer by quantum mechanical tunneling.

SEE OR SEARCH THIS CLASS, SUBCLASS:
832, for Josephson junction-type devices used in static information storage systems.
861, and 864, for Josephson junction devices used in nonlinear solid state device circuits of other utility.
874, for Josephson junction active solid state devices.

866 Wave transmission line, network, waveguide, or microwave storage device (Class 333/99):

This subclass is indented under subclass 825. Subject matter including systems or devices which transmit, guide, or store electromagnetic energy.

867 Electric power conversion system: (Class 363):

This subclass is indented under subclass 825. Subject matter including means to perform a sequence or combination of at least two of the operations of, (a) current conversion, (b) phase conversion, or (c) frequency conversion.

868 Current conversion: (Class 363/14):

This subclass is indented under subclass 867. Subject matter wherein a conversion system includes means to change alternating current into direct current, or vice versa.

869 Power supply, regulation, or energy storage system: (Class 323):

This subclass is indented under subclass 825. Subject matter wherein an electrical source is coupled to an electrical load circuit and means are provided to store electromagnetic energy or to supply or control either, (a) the magnitude of the voltage or the current in the load circuit, or (b) the phase angle between the voltage and the current in the load circuit.

870 Including transformer or inductor: (Class 323/360):

This subclass is indented under subclass 869. Subject matter wherein the load circuit is supplied with electricity by a transformer, an inductor, or a combination of the two.

871 Magnetic lens: (Class 250/396):

This subclass is indented under subclass 825. Subject matter including means to deflect, scan, spread, or focus a beam of electrically charged particles.

872 Magnetic field shield: (Class 307/91):

This subclass is indented under subclass 825. Subject matter including means to contain or otherwise limit the spatial distribution of a magnetic field.

SEE OR SEARCH THIS CLASS, SUBCLASS:

850, for superconductor protective circuits, per se.

873 Active solid state device: (Class 257):

This subclass is indented under subclass 825. Subject matter wherein a superconductive material forms a part of a solid state device such as a transistor or diode.

(1) Note. Active devices include transistors and diodes but exclude impedance only devices such as resistors, capacitors, and inductors, which are considered to be passive devices.

874 With Josephson junction (e.g., SQUID, etc.): (Class 257):

This subclass is indented under subclass 873. Subject matter including a device, known as a Josephson junction, which permits conduction by quantum mechanical tunneling through a thin dielectric layer situated between two superconductors.

SEE OR SEARCH THIS CLASS, SUBCLASS:

832, for Josephson junction-type devices used in static information storage systems.

861, 864 and 865, for Josephson junction devices used in nonlinear solid state device circuits of various utility.

875 Combined with housing and cryogenic fluid cooling: (Class 257):

This subclass is indented under subclass 873. Subject matter including, (a) fluid means to cool the device to the critical temperature for superconductivity, and (b) means to house the device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

878, for electrical generator or motor structure of the rotary dynamoelectric type with superconductive temperature cooling means.

883, for housings for plural diverse electrical components, per se.

885, for cooling of superconductors, per se.

876 Electrical generator or motor structure: (Class 310):
This subclass is indented under subclass 825. Subject matter wherein one or more structural members of an electric motor or generator exhibit superconductivity during operation of the motor or generator.

877 Rotary dynamoelectric type: (Class 310/40+):
This subclass is indented under subclass 876. Subject matter wherein the motor or generator includes a working member which rotates about an axis under the influence of electromagnetic forces.

878 With cooling: (Class 310/52+):
This subclass is indented under subclass 877. Subject matter wherein means are provided for cooling one or more structural members of the motor or generator in order to establish a state of superconductivity within the member(s).

SEE OR SEARCH THIS CLASS, SUBCLASS:
875, for active solid state superconductive devices combined with a housing and cryogenic cooling means.
885, for cooling of superconductors, per se.

879 Magnet or electromagnet: (Class 335/216):
This subclass is indented under subclass 825. Subject matter comprising, (a) structure of permanent magnets, electromagnets, or a combination of the two types, or (b) magnets or electromagnets adapted for use as a source of magnetic flux for performing mechanical work.

880 Inductor: (Class 336/DIG 1):
This subclass is indented under subclass 825. Subject matter comprising one or more coils, with or without a permeable core, whose sole purpose is to introduce inductance into an electrical circuit.

(1) Note. Both transformers and inductive reactors are included herein.

(2) Note. Excluded are inductor devices designed to, (a) produce a magnetic field which radiates energy not returned to the device, or (b) perform mechanical work.

881 Resistance device responsive to magnetic field: (Class 338/32):
This subclass is indented under subclass 825. Subject matter wherein a superconductive material forms a part of a resistor whose electrical resistance can be changed in proportion to the strength of an applied magnetic field.

882 Circuit maker and breaker: (Class 200):
This subclass is indented under subclass 825. Subject matter including devices of general application which are used for closing or opening electrical circuits and the combination of such devices with their operating means.

883 Housing and mounting assembly with plural diverse electrical components: (Class 361/331+):
This subclass is indented under subclass 825. Subject matter comprising structures for enclosing or supporting plural diverse electrical components.

SEE OR SEARCH THIS CLASS, SUBCLASS:
875, for housings combined with active solid state devices and cooling means.
885, for apparatus for mounting, supporting, or housing superconductors, per se.

884 Conductor: (Class 174):
This subclass is indented under subclass 825. Subject matter comprising details of the structure of superconductors or of apparatus for mounting, supporting, or housing superconductors, per se.

SEE OR SEARCH THIS CLASS, SUBCLASS:
875, for active solid state superconductor devices combined with a housing and cryogenic fluid cooling.
883, for housings and mounting assemblies with plural diverse electrical components.

885 Cooling, or feeding, circulating, or distributing fluid; in superconductive apparatus: (Class 174/15):
This subclass is indented under subclass 884. Subject matter including means for bringing a cooling fluid into thermal contact with a superconductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
875, for active solid state superconductor devices combined with a housing and cryogenic fluid cooling.
878, for rotary dynamoelectric-type electrical generator or motor structure with cooling.

886 Cable: (Class 174/15):
This subclass is indented under subclass 885. Subject matter wherein the superconductor is in the form of a cable.

887 Conductor structure: (Classes 174/126 and 128):
This subclass is indented under subclass 884. Subject matter including details of the structure of superconductors other than the structure providing for cooling or fluid feeding.

888 Refrigeration: (Class 62):
This subclass is indented under subclass 825. Subject matter including (a) process or apparatus peculiar to removing heat from a substance; (b) the resultant product of part a; or (c) process or apparatus peculiar to handling the latter as a stored product.

889 Utilizing rare earth material:
This subclass is indented under subclass 888. Subject matter wherein a material containing the chemical element Yttrium with atomic *number 39 or any of the group of chemical elements with atomic numbers 58 to 71 inclusive is used to remove heat.

890 Heat pipe device:
This subclass is indented under subclass 888. Subject matter wherein the apparatus includes an intermediate fluent heat exchanger for removing thermal energy, which intermediate heat exchanger employs solid or particulate material.

891 Magnetic or electrical effect cooling:
This subclass is indented under subclass 888. Subject matter wherein electromagnetic force is used to directly remove heat.

892 Magnetic device cooling:
This subclass is indented under subclass 888. Subject matter wherein the substance having heat removed therefrom is itself an electromagnetic apparatus.

893 Spectrometer:
This subclass is indented under subclass 892. Subject matter wherein the electromagnetic apparatus being cooled is a spectroscope.

894 Cyclic cryogenic system (e.g., Sterling, Gifford-McMahon, etc.):
This subclass is indented under subclass 888. Subject matter wherein the heat is removed by means of a generally closed repeating sequence of operations.

895 With regenerative heat exchanger:
This subclass is indented under subclass 894. Subject matter which includes an intermediate fluent means for trans ferring thermal energy.

896 Special refrigerant compound:
This subclass is indented under subclass 888. Subject matter wherein a particular unusual material consisting of atoms or ions of two or more different chemical elements in definite proportions and generally having properties unlike its constituent chemical elements is utilized for removing heat.

897 Cryogenic media transfer:
This subclass is indented under subclass 888. Subject matter specially adapted for handling and moving very low temperature material used for removing heat.

898 Cryogenic envelope:
This subclass is indented under subclass 888. Subject matter including structure or housing for preserving or maintaining a very low temperature.

899 Method of cooling:
This subclass is indented under subclass 888. Subject matter including processes specially adapted for (a) removing heat from a sub-

stance; (b) maintaining a very low temperature environment; or (c) preserving such an environment.

900 Heat exchange: (Class 165):
This subclass is indented under subclass 825. Subject matter including a process or device specially adapted for transferring thermal energy from one material to another material or the environment.

901 Heat pipe:
This subclass is indented under subclass 900. Subject matter wherein an intermediate fluent heat exchanger removes or transfers thermal energy, which intermediate heat exchanger employs solid or particulate material.

902 Railway (e.g., rapid transit, etc.): (Class 104):
This subclass is indented under subclass 825. Subject matter including (a) railroad rolling stock and track, each of which is modified for interrelation and cooperation with each other; (b) amusement or rapid transit railroad type apparatus; (c) process, fixture, or appliance specially adapted for use with a or b; and (d) any miscellaneous feature relating to a or b not elsewhere classified.

903 Suspension (e.g., magnetic, electrodynamic, etc.):
This subclass is indented under subclass 902. Subject matter wherein the railway system vehicle is adapted to travel along a guideway while held above the guideway by means of electromagnetic or other dynamic force.

904 Guidance means (i.e., in addition to the track):
This subclass is indented under subclass 903. Subject matter for structure or means, other than the track, which structure or means is especially adapted for regulating or directing the course of the railway vehicle.

905 Motor structure:
This subclass is indented under subclass 903. Subject matter including particular propulsion means for causing or producing motion.

906 Switching device (i.e., electrical <u>not</u> railway stock diverting):
This subclass is indented under subclass 903. Subject matter including means or structure for making and breaking an electrical circuit or to divert electrical current from one conductor to another.

907 Support structure:
This subclass is indented under subclass 903. Subject matter for a fixture, appliance, or feature which carries the weight of an article or otherwise holds or steadies an article against the pull of gravity.

908 Method of operation:
This subclass is indented under subclass 903. Subject matter including a process of directing, causing, or allowing a railway system or an essential part thereof to function.

909 Power plant: (Class 60):
This subclass is indented under subclass 825. Subject matter involving the driving of a load by means of conversion of heat, pressure, radiant, gravitational, or other energy source into mechanical motion.

910 Pump: (Class 417):
This subclass is indented under subclass 825. Subject matter including process or apparatus especially adapted for moving a slurry, fluent material, or the like, if moved in a manner not inconsistent with the handling of fluid, from one place or location to another place or location different from whence it came.

911 Fluid reaction surface (i.e., impeller): (Class 416):
This subclass is indented under subclass 825. Subject matter including a working structure which interacts with a working fluid so as to cause reactive movement of the working structure or, alternatively, reactive movement of the working fluid.

912 Metal founding: (Class 164):
This subclass is indented under subclass 825. Subject matter including process or apparatus (a) for shaping fluid metallic material; (b) for shaping of fluent material to produce a mold to carry out a; (c) for shaping a fluent material to produce a form or pattern to be used in b: (d)

for treating, mixing, or mechanically working a metallic material while molding or while the metallic material is in a mold; or (e) not elsewhere provided for to perfect or effect a or b.

913 Casting process:
This subclass is indented under subclass 912. Subject matter including a process of shaping fluent metallic material against a forming surface.

914 Using magnetic or electric field:
This subclass is indented under subclass 913. Subject matter wherein an energy quantity such as an electromagnetic wave or an electric field is applied directly to the work material.

915 Making composite product:
This subclass is indented under subclass 913. Subject matter including a process of producing a multilayered article having at least two distinct zones of metal of the same or different materials.

916 Continuous casting:
This subclass is indented under subclass 913. Subject matter wherein a portion of a cast product is removed from a forming mold or surface as a further contiguous portion is cast.

917 Mechanically manufacturing superconductor: (Classes 29, 72, and 228):
This subclass is indented under subclass 825. Subject matter for mechanically manufacturing a superconductor including (a) process or apparatus for metal working, shaping, or deforming; (b) process or apparatus for metal fusion bonding, by means other than electric heating, two juxtaposed or engaging form-sustaining work parts or (c) combined diverse process or apparatus of a and b; or (d) combined diverse mechanical manufacturing process or apparatus not elsewhere classified.

918 With metallurgical heat treating:
This subclass is indented under subclass 917. Subject matter including thermal treatment, other than a simple anneal or stress relief, to effect a permanent chemical or physical change in the properties of a metal workpiece.

919 Reactive formation of superconducting intermetallic compound:
This subclass is indented under subclass 918. Subject matter wherein the heat treating creates a superconducting layer or portion thereof by means of a chemical reaction involving two or more metallic constituents, at least one of which is generally supplied by diffusion.

920 Utilizing diffusion barrier:
This subclass is indented under subclass 919. Subject matter wherein the actual transport, i.e., diffusion, of discrete atoms through the lattice of the workpiece is directly regulated generally to minimize undesired side reactions produced by the heat treating.

921 Metal working prior to treating:
This subclass is indented under subclass 919. Subject matter wherein metal deforming or shaping is done before the heat treating creates the superconducting intermetallic compound.

922 Making Josephson junction device:
This subclass is indented under subclass 917. Subject matter for manufacturing a device or article having the Josephson effect, i.e., the tunneling of electron pairs through a thin insulating barrier between two superconducting materials.

923 Making device having semiconductive component (e.g., integrated circuit, etc.):
This subclass is indented under subclass 917. Subject matter for manufacturing a device or article which includes a solid crystalline material whose electrical conductivity is intermediate between that of a metal and that of an insulator, ranging from about 105 mhos to 10 - 7 mhos per meter, and is generally strongly temperature dependent.

924 Making superconductive magnet or coil:
This subclass is indented under subclass 917. Subject matter for manufacturing (a) a spiral or helical arrangement of superconducting material or (b) an electromagnet whose winding is made of a superconductor.

925 Making superconductive joint:
This subclass is indented under subclass 917. Subject matter for manufacturing a superconducting device or article having a junction of

two superconductors or other superconducting paths for current, which junction, per se, is superconducting.

926 Mechanically joining superconductive members:
This subclass is indented under subclass 917. Subject matter for manufacturing a superconducting device or article having a junction of two superconductors, which junction is an assembly or uses a separate fastener part.

927 Metallurgically bonding superconductive members:
This subclass is indented under subclass 917. Subject matter for manufacturing a superconducting device or article having a junction of two superconductors, which junction is effected by metal fusion welding.

928 Metal deforming:
This subclass is indented under subclass 917. Subject matter including a metal working or shaping step.

929 By extruding:
This subclass is indented under subclass 928. Subject matter wherein the metal deforming includes forcing the metal work through an orifice of a die to produce a continuously formed product.

930 By drawing:
This subclass is indented under subclass 928. Subject matter wherein the metal deforming includes pulling the metal work through a die to reduce the work's cross section.

931 Classifying, separating, and assorting solids using magnetism: (Class 209):
This subclass is indented under subclass 825. Subject matter including method or apparatus, which sets apart, distributes into groups of like kind, or segregates solid materials by means of electromagnetic force, which causes the solid material to be separated according to the degree of responsivity to such force.

932 Separating diverse particulates:
This subclass is indented under subclass 931. Subject matter for separating different types of unlike particles or very small pieces.

933 In liquid slurry:
This subclass is indented under subclass 932. Subject matter wherein the diverse particulates to be separated are supplied in free-flowing pumpable suspension in a liquid.

950 MANUFACTURING SYSTEM OR APPARATUS FOR MAKING HIGH TEMPERATURE (I.E., T_c GREATER THAN 30 K) SUPERCONDUCTOR PRODUCT, DEVICE, ARTICLE, OR STOCK (I.E., WHICH SYSTEM OR APPARATUS DOES NOT ITSELF CONTAIN A SUPERCONDUCTING COMPONENT):
Cross-reference art collection of systems or apparatus utilized for the manufacturing of high temperature (T_c 30 K) superconductor product, article, or stock that is not itself a superconductor product, device, article, or stock and that does not contain a superconducting component.

951 NPL PLUS FP HIGH TEMPERATURE (T_c GREATER THAN 30 K) SUPERCONDUCTOR: MATERIAL (I.E., ELEMENT, COMPOUND, OR COMPOSITION) DEVICES, SYSTEMS, APPARATUS, COMPONENTS, STOCK, PROCESSES OF USING SAME, OR PROCESSES OF PRODUCING OR TREATING HIGH TEMPERATURE (T_c GREATER THAN 30 K) SUPERCONDUCTOR MATERIAL OR SUPERCONDUCTOR CONTAINING PRODUCTS OR PRECURSORS THEREOF:
Cross-reference art collection of nonpatent literature and foreign patents for high temperature (T_c 30 K) superconductors including material (i.e., element, compound, or composition), devices, systems, apparatus, components, stock, processes of using same, or processes of producing or treating high temperature (T_c 30 K) superconductor material or superconductor containing products or precursors thereof.

(1) Note. This collection of prior art, due to its unique origin and chronological numbering of nonpatent literature, is retained intact providing a backup file. Accession numbering found on the earlier nonpatent literature is linked to a biblios:graphic file enabling the

identification and reordering of lost copies. This subclass may eventually be eliminated.

END